

WHAT IS CLAIMED IS:

1. Filtration apparatus comprising:

a filter housing having a fluid inlet and a fluid outlet;

filtration media comprising a plurality of individual compressible fibrous lumps of adjustable porosity and collector size disposed in a filter bed within said filter housing between said fluid inlet and said fluid outlet;

means for adjusting the porosity and collector size of the filtration media, said means including means for compressing said filtration media in a compression gradient proceeding from more compressed to less compressed in a direction opposite to the flow of fluid so that filtration proceeds in a direction from a more porous to a less porous filter.

2. Apparatus of Claim 1 wherein said means for compressing said filtration media comprises:

a first perforated panel immovably mounted within said apparatus;

a second perforated panel movably mounted within said apparatus and spaced above said first perforated panel; and

means for selectively moving said movably mounted second perforated panel toward and away from said first perforated panel, said means being located above said second perforated panel.

3. Apparatus of Claim 2 further comprising means for agitating said filter media in an uncompressed condition to clean said filter media.

4. Apparatus of Claim 1 wherein said fluid inlet is disposed below said fluid outlet and said filter is operated in an upflow mode.

5. Apparatus of Claim 1 wherein said means for adjusting the porosity and collector size of the filtration media is adjustable during filtration.

6. Apparatus of Claim 1 wherein said filter bed has a porosity of about 92 to 94% prior to compression and a porosity of from about 87 to 90% when compressed.

7. Apparatus of Claim 1 wherein said filter bed prior to compression has a depth of at least about 30 inches (760 mm).

8. Apparatus of Claim 1 wherein said apparatus is operable for filtration at a fluid flow rate of from about 205 to 1230 L/m²•min (5 to 30 gal/ft²•min), at a bed compression ratio of from about 0 to 40 percent, and at a backwash rate of from about 1 to 6 percent based on the total fluid passing through the filter.

9. Apparatus of Claim 8 wherein said fluid flow rate is from about 410 to 1230 L/m²•min (10 to 30 gal/ft²•min).

10. Apparatus of Claim 8 wherein said fluid flow rate is from about 820 to 1230 L/m²•min (20 to 30 gal/ft²•min).

11. Filtration apparatus comprising:

a filter housing having a fluid inlet and a fluid outlet, wherein said fluid inlet is disposed below said fluid outlet and said filter is operated in an upflow mode;

filtration media comprising a plurality of individual compressible fibrous lumps of adjustable porosity and collector size disposed in a filter bed within said filter housing between said fluid inlet and said fluid outlet;

a first perforated panel immovably mounted within said apparatus;

a second perforated panel movably mounted within said apparatus and spaced above said first perforated panel; and

means for selectively moving said movably mounted second perforated panel toward and away from said first perforated panel, said means being located above said second perforated panel, whereby the porosity of said filter bed can be adjusted by compressing the media.

12. The apparatus of Claim 11 wherein the porosity of said filter bed can be adjusted from a porosity of about 92 to 94% prior to compression to a porosity of from about 87 to 90% when compressed.

13. Apparatus of Claim 1 wherein said apparatus is operable for filtration at a fluid flow rate of from about 820 to 1230 L/m²•min (20 to 30 gal/ft²•min), at a bed compression ratio of from about 15 to 40 percent, and at a backwash rate of from about 1 to 6 percent based on the total fluid passing through the filter.

14. Filtration apparatus for wastewater treatment comprising:
an inlet for introducing wastewater into said apparatus for upward flow through said apparatus;
an outlet for discharging filtered wastewater from said apparatus;
a first perforated panel immovably mounted within said apparatus;
a second perforated panel movably mounted within said apparatus and spaced above said first perforated panel;
means for selectively moving said movably mounted second perforated panel toward and away from said first perforated panel, said means being located above said second perforated panel;
a filtration media comprising a plurality of individual compressible fibrous lumps disposed between said first and second perforated panels and defining a filter bed, wherein said compressible media is compressed for filtration in a gradient proceeding from more compressed to less compressed in a direction opposite to the flow of fluid so that filtration proceeds in a direction from a more porous to a less porous filter bed, and wherein said filter bed is expanded for cleaning; and
means for introducing a gas into said wastewater when said filter bed is expanded for cleaning.

15. The apparatus of Claim 14 wherein said inlet further comprises a plenum to evenly distribute the wastewater through said first perforated panel.

16. Apparatus of Claim 16 wherein said apparatus is operable for filtration to reduce the turbidity of influent wastewater from about 8 NTU to about 2 NTU at a wastewater flow rate of from about 820 to 1230 L/m²•min (20 to 30 gal/ft²•min), at a bed compression ratio of from about 15 to 40 percent, and at a backwash rate of from about 1 to 6 percent based on the total wastewater passing through the filter.

17. Apparatus of Claim 16 wherein the backwash flow rate is from about 1 to 3 percent based on the total wastewater passing through the filter.